



Authorizations and Permits for Protected Species (APPS)

File #: 18181-3A

Title: Rescue and Relocation of ESA-listed Salmonids

Applicant Information

Affiliation: California Department of Fish and Wildlife, Fisheries Branch

Address: 830 S Street

City,State,Zip: Sacramento, CA 95811

Project Information

Report Number: 1 (Annual Report)

Report Period: 01/01/2016 to 12/31/2016

Report Status: **Submitted**

File Number: 18181-3A

Project Title: Rescue and Relocation of ESA-listed Salmonids and SDPS Green Sturgeon in California's Central Valley.

Project Status: New

**Previous Federal
or State Permit:** 18181-2M

Permit Requested: • ESA Section 10(a)(1)(A) permit (Pacific fish/invertebrate enhancement)

**Where will
activities occur?** California (including offshore waters)

**Research
Timeframe:** **Start:** 11/29/2016 **End:** 12/31/2020

Sampling Season/Project Duration:	<p>Permit 18181-3A covers rescue operations within California's Central Valley in response to extreme environmental conditions and complex water operations. Rescues and monitoring will follow these general directions:</p> <ol style="list-style-type: none"> 1) Trapping and relocation of adult salmonids and SDPS green sturgeon entering the Colusa Basin Drainage Canal at Wallace Weir- carried out year-round, annually. 2) Monitoring at Tisdale and Fremont weirs relies upon high flow events of sufficient magnitude to result in weir and bypass flooding. As high flow events do not occur every year, the duration of this project is dependent upon environmental conditions. 3) Extreme drought in the Central Valley has resulted in limited reservoir storage and reductions in flow. These conditions will likely lead to redd dewatering and stranding of juvenile salmonids in the Upper Sacramento River Basin including associated tributaries. Rescues/relocation of stranded juveniles will be conducted year-round as needed.
Abstract:	<p>The primary purpose of Permit 18181-3A will be to assess entrainment of ESA-listed salmonids and SDPS green sturgeon resulting from extreme environmental conditions and complex water operations within California's Central Valley. The fishery agencies generally consider fish rescue efforts a last resort, as long-term survival benefits of such activities are unclear. Fish rescues can mask important underlying land and water development problems that might be causing or contributing to the isolation or stranding of fish. In addition, periodically disconnected habitats and isolation caused by drought and fluctuating water supply are in some degree natural events and likely important to natural selection processes.</p> <p>In some instances (i.e. trapping operations at Wallace Weir Facility), CDFW aims to prevent entrainment by trapping and relocating adult fish species of concern before they encounter inhospitable conditions. Other times, entrainment results from environmental conditions such as flooding or drought. These conditions are often exacerbated by diversions and ongoing water operations. CDFW will assess the conditions leading to entrainment and determine whether rescue and relocation activities are warranted.</p> <p>CDFW currently serves as the lead fishery agency for all fish rescue actions. In that capacity, CDFW will make the final decision about whether to pursue a rescue effort in accordance with the Key Rescue Objectives and Principles found within the Interagency Anadromous Fish Rescue Strategy (attached).</p>

Project Description

Purpose:	<p>The indigenous, anadromous fish populations of California's Central Valley have been severely reduced due to a variety of man-caused alterations to the environment. The region's anadromous fish populations have been extirpated from most of their historic range and the existence of the few remaining depleted populations are continually challenged. Diversions and bypasses such as the Colusa Basin Drainage Canal (CBDC) and both Fremont and Tisdale weirs affect immigration and emigration cues for anadromous fish. With escapement numbers of Sacramento River winter-run Chinook salmon measured in the thousands, any loss to the spawning population is significant. Further, reduced flows and higher water temperatures in the upper Sacramento River associated with extreme drought conditions may lead to substantial losses to both incubating eggs and emergent fry. These losses occur through lethal water temperatures or standing as a result of reduced flows. Sacramento River flow management decisions are often the cause of stranding in this section of the river and management of flows is the best way to avoid the need for fish rescues and relocation. In order to circumvent potential losses and contribute towards the continued existence and recovery of the sole remaining population of the endangered Sacramento River winter-run Chinook salmon evolutionary significant unit (ESU), CDFW has identified the following rescue and relocation activities that may be carried out depending on environmental conditions.</p>
-----------------	---

Wallace Weir Trapping and Relocation Operation

The previously un-diagnosed stranding of winter-run Chinook salmon in the CBDC and the ongoing potential for entrainment of ESA-listed salmonids and SDPS green

sturgeon behind flood relief structures, if fixed, could be a substantial advancement to enhancing the spawning populations. Attempts will be made to trap and relocate adult Chinook salmon and other species of management concern before they enter and become entrained within the CBDC. Wallace Weir within the Yolo Bypass has been identified as a potential entry point into the CBDC. On June 20, 2016, NMFS completed a Section 7 Consultation and issued a biological opinion to the U.S. Army Corps of Engineers (USACE) for the Wallace Weir Fish Rescue Project (WCR-2016-5014), which involves construction of a new, permanent weir with a flow control structure, installation of a positive fish barrier (i.e., picket weirs), construction of an access road and bridge across the new weir and a control building for the new flow control structure, demolition of the existing weir, and construction of a permanent fish rescue facility to replace the temporary fyke trap previously used for fish collection (authorized under Permit 18181-2M). Although the biological opinion issued to the USACE authorizes the construction activities outlined above, it does not authorize the rescue and relocation of ESA-listed salmonids and SDPS green sturgeon at the new fish trapping facility. Operation of the new fish collection facility for purposes of collecting, handling, and transporting captured fish is proposed under Permit 18181-3A.

Wallace Weir Fish Rescue Program Objectives:

- 1) Collect and relocate Target Species that become entrained at the fish collection facility at Wallace Weir.
- 2) Record and report numbers and species composition of trapped fish and maintain a program database.
- 3) Mark and/or tag Target Species collected at the facility and collect genetic samples.
- 4) Refine fish rescue methods to minimize handling stress and costs of operations.
- 5) Document the magnitude of stranding of Target Species and to the extent possible document survival and spawning success of fish through mark and recapture methods and acoustic tracking.
- 6) Document any weir over-topping resulting in the potential for fish to move into the CBDC. This will be used to inform the need for potential rescues in other areas of the CBDC watershed.

Rescue and Relocation associated with Sacramento River Flood Control Project Weirs and Flood Relief Structures – Tisdale and Fremont Weirs

Both the Sutter and Yolo bypasses will be surveyed after high flow events with a specific focus on Tisdale and Fremont weirs in the Sacramento River (see attached document; CDWR 2010, Flood Operations Branch, Fact Sheet Sacramento River Flood Control Project Weirs and Flood Relief Structures). During high flow events a significant proportion of the Sacramento River is diverted into the Sutter and Yolo Bypass through specific flood relief structures. Substantially more water can be passing through the bypasses than is in the river itself during these flood events. This dramatically alters not just the volume of water in the main channel but the variations in flow over time. Fish in the river downstream of these flood relief structures experience a drastically different flow regime than fish do upstream of these structures. This can affect immigration and emigration cues for anadromous fish. Adult fish migrating upstream may be attracted into the bypasses. Additionally, during high flows that overtop the flood relief structures (weirs), a large percentage of out-migrating fish in the river may be diverted into the bypass. As flows recede many of these fish can then become stranded in the bypasses. This has implications on detectability of fish moving past in-river monitoring sites and is of special concern when tracking movement of listed stocks. More importantly entrainment and stranding can result in significant mortality for fish including listed species. Rescue efforts provide an invaluable opportunity to save stranded fish while learning from them. Because each stranded individual would perish in the absence of intervention, data collection for this study can be viewed as information gathered from salvaged specimens (see description of Salvage Specimens in NOAA Tech Memo NMFS-OPR- 45, March 2010, pg. 48). It is crucial to identify the level of impact flood relief structures and diversions are having on populations of listed species and to identify whether stranded fish can successfully contribute to the population after being rescued. Information from this study has management implications for water project operations.

Upper Sacramento River Redd Dewatering Surveys and Rescue of Stranded Juvenile Winter-run Chinook Salmon

Beginning in 2013 an effort has been made by the fisheries agencies to annually monitor winter-run Chinook salmon redds. Monitoring includes: searching for, identifying, marking, and repeated measuring of winter-run redds found in shallow water. This monitoring allows CDFW biologists to predict the flow at which redds will be dewatered on a

redd-by-redd basis. Given this knowledge, it is possible to physically modify redds in danger of being dewatered to lessen the impacts to emerging juveniles in each redd. Ideally, Keswick releases would be managed to protect winter-run redds from dewatering. Unfortunately, the unprecedented drought has reduced Shasta storage to historic lows, leaving little flexibility for reservoir releases and the protection of salmonids.

CDFW understands that the ideal situation is not to disturb Chinook salmon redds at all. However, in case of dewatered redds, the disturbance is justified as an attempt to provide as much opportunity for survival as possible while minimizing disturbance. As redds become dewatered, the top of the redd emerges from the water preventing emergent fry from exiting through the top of the redd. Further, the water velocity around the remaining redd area is typically reduced, resulting in less flow through the redd. This can trap emerging fry, preventing them from departing the underwater sides of the redd and reducing available dissolved oxygen and raising water temperatures. Removing existing substrate from the top of dewatered redds will produce more flow over and through the redd, and theoretically, allow for fry emergence and passage to the surrounding river.

Reduced flows not only affect incubating eggs and emergent fry. Juvenile salmonids can become stranded when reduced flows from Keswick Dam result in isolated pools or channels which were previously connected (allowing free passage) at higher flows to the Sacramento River. Stranding can lead to direct mortality when these areas drain or dry up. Indirect mortality can result through increased susceptibility to predators (otters, raccoons, birds, etc.) or water quality deterioration (increased water temperature, reduced dissolved oxygen, etc.) in shallow or stagnant stranding locations (Jarret and Killam 2014). CDFW agrees that the ideal situation is to leave fish undisturbed unless there is a high likelihood that the stranding site would not be reconnected with the stream in the immediate future.

Fish rescues will also be conducted in Shasta and Tehama counties including but not limited to the following locations: Sacramento River, Deer Creek, Mill Creek, Antelope Creek, and various urban streams. Fish rescues may also occur on other Sacramento River tributaries but are not anticipated on a regular basis as those mentioned above.

Objectives are to:

- 1) Capture, tag and relocate Sacramento River winter-run Chinook salmon and other species of management concern in the lower reaches of the CBDC at Wallace Weir within the Yolo Bypass.
- 2) Construct and place modified fyke traps at key locations within the interior of the CBDC system to capture, tag and relocate stranded fish if fish passage occurs at the Wallace Weir Trapping Facility.
- 3) If environmental conditions (high flows, flooding) warrant monitoring and rescue of fish entrained behind Fremont and Tisdale weirs, CDFW aims to assess the level of entrainment and evaluate the survival and behavior of entrained adults that are rescued and relocated.
- 4) Monitor winter-run Chinook salmon redds by identification of redds at risk of being dewatered, marking of redds, and repeated measurements of water levels around redds. This monitoring allows CDFW biologists to predict the flow at which redds will be dewatered on a redd-by-redd basis.
- 5) If deemed necessary, CDFW may physically modify redds in danger of being dewatered to lessen the impacts to emerging juveniles within each redd.
- 6) Survey known stranding sites immediately following Keswick Dam flow reductions (as feasible), to determine if a fish rescue is necessary.
- 7) Conduct fish rescues in Shasta and Tehama counties including but not limited to the following locations: Sacramento River, Deer Creek, Mill Creek, Antelope Creek, and various urban streams as needed.
- 8) Identify conditions resulting in high levels of entrainment specific to each location.

Description: During high flow events a significant proportion of the Sacramento River is diverted into the Sutter and Yolo Bypass through specific flood relief structures. Substantially more water can be passing through the bypasses than is in the river itself during these flood events. This dramatically alters not just the volume of water in the main channel but the variations in flow over time. Fish in the river downstream of these flood relief structures experience a drastically different flow regime than fish do upstream of these structures. Furthermore, agricultural diversions and drainages take Sacramento River water and send it through a maze of canals, ditches, and natural streams down the heart of California's Central Valley, from as far north as Glenn County, and drain it back into the Sacramento River just a few miles from where it branches off from the confluence of the San Joaquin River. The main structure running the length of the agricultural area is the CBDC. This influence of Sacramento River water can cause migrating salmon to stray into waterways that are not conducive to spawning or have no easy returns to the River.

Significant reductions in flow also have the potential to entrain salmonids. Stable and continuous river flows are important to the early life history (egg incubation to emergence from the gravel) of salmonids. If redds are dewatered or exposed to warm, deoxygenated water, incubating eggs/larval fish may not survive. After emergence from their redd, juvenile salmon can become stranded in shallow isolated water and be exposed to the same poor environmental conditions as well as increased predation. For the eggs and juveniles to survive they need water, of a suitable temperature, velocity, and water quality, at all times. Juvenile stranding surveys are implemented to observe and report on locations that could potentially contain stranded salmonids that are isolated to varying degrees by flow reductions. Attempts will be made to capture and relocate stranded juveniles to more suitable habitat. Further, CDFW will assist with the emergence of stranded fry in redds at risk of being dewatered. This effort should be considered as a last resort to increase the opportunity for juvenile Sacramento River winter-run Chinook salmon to emerge from a redd that is going to be dewatered by flow reductions.

Recovery and Relocation of Fish Entering the CBDC at Wallace Weir Fish Facility

Wallace Weir is located at the terminus of the Knights Landing Ridge Cut and the west levee of the Yolo Bypass, approximately three miles north of Interstate 5 and five miles northeast of the City of Woodland. The new permanent structures associated with the new Wallace Weir Fish Facility will improve flow control for agricultural purposes and function to rescue fish for relocation to the Sacramento River. CDFW's rescue and relocation efforts to date have provided an understanding of timing and magnitude of potential fish entrainment and loss, as well as conditions that can exacerbate the potential for fish entrainment. These efforts have also allowed for methods and protocols to be developed and refined that minimize handling stress and lethal take of ESA-listed species during rescue efforts.

CDFW will check the fish collection facility at Wallace Weir on a daily basis or more frequently if necessary. The facility will impound all fish species, so all fish present will be handled and removed from the fish collection facility. Target Species and Species of Management Concern will be prioritized for collection, processing, transportation, and release back to the Sacramento River. The Sacramento River release location(s) will be evaluated and may vary with species and time of year, but will only occur in locations where CDWR or CDFW have property rights or landowner permission to carry out fish releases. All salmonids and sturgeon will be identified to species, measured and evaluated for condition and sexed if possible. To document the magnitude of stranding of ESA-listed fish, genetic samples will be collected from all salmonids. To allow information to be gathered on movement, survival, and spawning success after releases, salmonids and sturgeon that are rescued will be marked and/or tagged. Species other than Target Species or Species of Management Concern that are found in the facility will be passed through to the upstream or downstream side of the weir using infrastructure incorporated into the facility.

Potential Rescue/Salvage in the upper CBDC

If and when fish passage is thought to occur (in the unlikely event that the trapping facility experiences operational issues), CDFW will initiate a roving survey using dual identification sonar (DIDSON) imagery at known choke points within the CBDC and associated tributaries to look for focal species. Sonar imagery will help to identify substrate complexity, species presence/absence, and potential capture equipment needed for a rescue. Sonar imagery will also be helpful in identifying underwater hazards that may foul capture gear or be dangerous for CDFW personnel to work near.

Once focal species are determined to be present at any one location in the CBDC, CDFW will focus efforts to capture and then relocate wayward fish to the Sacramento River. Semi-permanent barriers and fyke traps may be installed upstream in key areas within the CBDC such as, but not limited to, the CBDC diversion structure at the juncture of Hunter Creek, under the 4 Mile Road Bridge and Dam 3 locations on Hunters Creek, Dam 1 at North Logan Creek; the confluence of Logan and North Logan Creeks, the confluence of Stone Corral Creek and Funks Creek, and the CBDC near the Delevan NWR. CDFW discovered that fish strayed to these locations during the 2012/13 season. Each rescued fish will be measured, sampled for tissues (genetic testing), tagged externally with two individually-numbered Floy tags, placed in a 350-400 gallon fish transport truck and returned to the Sacramento River at Tisdale Weir.

Monitoring Entrainment and Rescue of Fish at Fremont and Tisdale Weirs

CDWF aims to identify the level of SDPS green sturgeon entrainment and stranding into Sacramento River flood relief structures and bypasses, survival and behavior of entrained adults that are rescued, and to identify conditions resulting in high levels of entrainment specific to each location. In this effort, flood relief structures will be monitored after high flow events throughout the Sacramento River. Any stranded adult sturgeon will be captured if possible using block nets and hoop nets, measured and tagged both acoustically (internal VEMCO acoustic tags) and with two colored and individually numbered Floy tags. If any adult or juvenile Chinook salmon or steelhead are found to be entrained during rescue efforts, they will be captured using beach seines, their presence will be documented. Adult salmonids will be tagged with two colored and individually numbered Floy tags. Steelhead (adults and juveniles) may also receive a PIT tag as part of CDFW's Steelhead Monitoring Program. All rescued fish will be transported to the nearest Sacramento River location and released.

Upper Sacramento River Redd Dewatering Surveys and Rescue of Stranded Juvenile Winter-run Chinook Salmon

CDFW staff will survey known stranding sites immediately following Keswick flow reductions (as feasible), to determine if a fish rescue is necessary. If determined necessary, CDFW staff will seine, net, or electrofish (in this order of priority to reduce negative impacts to already stressed fish) stranding locations based on staffs experience and feasibility at each location. Fish will be enumerated by species and race (visually estimated), then immediately transported by bucket to an adjacent –river section that is not isolated. See Jarret and Killam 2014 (attached) for data collection protocols. Side channel sites (both natural and restored) may also be surveyed in order to get lengths and weights on captured Chinook salmon to calculate condition factor of fish using various restored habitats.

Winter-run redds in shallow water will be identified and monitored by boat crews to determine formation date and subsequent emergence date of each redd. These redds will be repeatedly measured to determine the depth of water column above the highest point of the redd during each river flow reduction. When a redd is in jeopardy of becoming dewatered, (based on the redd depth and the schedule of flow reductions) CDFW may take action to reduce the impacts of dewatering. Just prior to a Keswick flow reduction (1-2 days), if deemed necessary, a field crew will gently remove substrate from the tops of redds that are likely to become dewatered (e.g. redds in water 2-3 inches or less before a 250 cfs reduction). Crews can attempt to remove by hand the rocks from the tops of redds to a sufficient depth that will allow water to remain freely flowing over the redd top after the forecasted flow reduction. Redd tops will be removed using a slow and gentle manner to minimize abrasion impacts to fry in the uppermost area removed. Water velocity will be measured at the redd before and after the substrate removal process. Water depth measured from the redd top to the water surface will also be recorded pre and post rock removal. Photographs will document the substrate removal process. Numbers of fry observed during the redd removal will be noted. Crews will revisit and repeat if necessary on the monitored redds until after the emergence date of each redd in the effort has passed.

If any redds become entirely dewatered, CDFW staff may remove rocks and dig up redd to determine the level of mortality that occurred as a result of dewatering the redd. It is important to document whether there is significant mortality occurring as a result of flow reductions and changes in water operations in the upper Sacramento River.

Upper Sacramento River Basin Tributaries

Fish rescues will also be conducted in Shasta and Tehama counties including but not limited to the following locations: Deer Creek, Mill Creek, Antelope Creek, and various

urban streams. Fish rescues may also occur on other Sacramento River tributaries but are not anticipated on a regular basis as those mentioned above.

Water diversion structures along various creeks and tributaries to the Upper Sacramento River have the potential to entrain ESA-listed salmonids. Although screened, these diversions have not been equipped with fish bypass return structures. When these diversions are operated in the spring, out-migrating juvenile Chinook salmon, juvenile steelhead, adult steelhead kelts, and other fish are drawn into the ditches and are trapped between the diversion head-gates and the fish screens. Once entrained, these fish must be manually captured and released downstream of the diversion or they will succumb to predation or lethal summer water temperatures.

The capture method will primarily be beach seining. When seining is not feasible other methods such as fyke netting, backpack electroshocking or hook and line may be used as a last resort. If necessary, a one-ton flat-bed truck fitted with a 200 gallon oxygenated water tank will be used to transport rescued salmonids. If staff find a suitable release location nearby, fish may be relocated by hand (aerated buckets) to avoid transportation by truck. Rescued fish will be relocated and released at the Sycamore Boat Launch downstream from the Red Bluff Diversion Dam (RM 243) or the nearest suitable release location on the Upper Sacramento River.

Supplemental Information

Status of Species: Central Valley spring-run Chinook salmon (NMFS Threatened)
Sacramento River winter- run Chinook salmon (NMFS Endangered)
California Central Valley Steelhead (NMFS Threatened)
Green Sturgeon Southern DPS (NMFS Threatened)

The decline of Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*) remains a major water management concern in the Sacramento River Basin. Winter-run is endemic to California's Central Valley, where only one population remains. Historically, winter-run spawned in the headwaters of the upper Sacramento River and its tributaries. Since the construction of Shasta Dam in 1945, winter-run spawning has been limited to a relatively small cold-water reach just downstream of Keswick Dam. The population's decline in the 1970 to 1980s and restricted habitat range are primary reasons for their endangered status under the federal Endangered Species Act (Federal Register 1994) and California Endangered Species Act (Title 14, Section 670.5) (Rosario and others 2013). Additionally, Central valley spring-run Chinook salmon are nearly exclusive to the upper Sacramento system where remaining populations occur in limited, isolated locations including Deer, Mill, and Butte creeks.

Methods: Trapping and relocation at Wallace Weir and the CBDC
On a daily basis CDFW will check the fish trap at the Wallace Weir Fish Facility. The facility will impound all fish species, therefore all fish present will be identified and removed from the fish collection facility. ESA-listed species captured in the facility will be prioritized for collection, processing, transportation, and release back to the Sacramento River following the approved protocol. The Sacramento River release location(s) will be evaluated and may vary with species and time of year, but will only occur in locations where CDWR or CDFW have property rights or landowner permission to carry out fish releases.

When feasible, biological data will be collected for all Chinook salmon, steelhead, and sturgeon captured and relocated (species and or run identification, fork length, sex, physical condition, ad-clip status for salmonids, and tissue samples for genetic analysis). Captured steelhead may receive a PIT tag as part of CDFW's Steelhead Monitoring Program. When large numbers of Chinook salmon are encountered, biological data will be collected on a systematic subsample of fish (every nth fish sampled). Tissue samples for genetic analysis will be collected and will be labeled and preserved using standard techniques.

To allow information to be gathered on movement, survival, and spawning success after releases, salmonids and sturgeon that are rescued will be marked or tagged (Floy tags, PIT tags, and/or acoustic tags may be used). Species other than Target Species or Species of Management Concern that are found in the facility will be passed through to the upstream or downstream side of the weir using infrastructure incorporated into the facility.

When fish passage is thought to occur at the Wallace Weir Fish Facility, CDFW will initiate a roving survey using DIDSON imagery at known choke points within the CBDC and associated tributaries to look for focal species. A DIDSON 300 unit with a 60 meter cord will be used for these purposes. The video quality of this unit allows for images of fish and substrate characteristics in turbid water bodies. The unit has a 30 meter viewing range, critical for making observations in many of the choke points in the CBDC where fish may congregate. The DIDSON unit will be attached to an aluminum staff. Field staff will deploy the unit by hand at each monitoring location.

DIDSON sonar images will be read in real-time by field staff as images are being acquired and recorded to an associated field laptop hard drive. DIDSON image files from each site will be transferred to a dedicated electronic storage file in the CDFW Region II office when staff return from the field. Downloaded videos will be reviewed at the office the same day they were recorded to ensure presence or absence of focal species at sampling locations. If a focal species is observed while in the field or upon review of DIDSON video while at the office, field staff will immediately inform project leads who will initiate rescue operations.

Monitoring and Rescue at Fremont and Tisdale Weirs

Block nets and hoop nets will be used to capture entrained adult sturgeon. Acoustic tags will be surgically implanted by trained department staff (training by UCD/USBR staff) and data will be recorded on fish size, condition, and time of release. Additionally, abiotic data will be recorded including river conditions prior to and during entrainment and the duration of entrainment will be calculated to the extent possible. After capture, adults will be held in a fish stretcher or cradle, ventral side up. Gills will be continually irrigated with water. Fish will be quickly assessed for physical condition, then acoustically tagged and PIT tagged. For insertion of the acoustic tag, a small incision (11mm for V9 tags) will be made between the third and fourth ventral scute, approximately 2-3mm off the ventral midline. The tag will then be inserted into the peritoneal cavity and closed with a 4/0 PDSII absorbable suture. To help with external identification, a photograph will be taken prior to release and fish will be externally tagged with two Floy tags. Genetic samples may also be taken and retained by CDFW staff.

If adult or juvenile salmonids are found to be entrained, they will be captured using beach seines. Data collected will be similar to that described for sturgeon, however salmonids will not receive acoustic tags. Adult Chinook salmon will however receive two Floy tags and be sampled for tissues. Additionally, rescued steelhead may receive a PIT tag as part of CDFW's Steelhead Monitoring Program. After processing, fish will be transported to the closest accessible point on the Sacramento River to the rescue site. If this distance is less than 100 yards fish will be directly transported to the river using the stretcher. If this distance is greater than 100 yards then fish will be placed in a specialized holding tub with aerated water and transported by truck to the nearest possible release location. Fish will not be anesthetized during the tagging process since the use of MS-222 requires a 21-day holding period. Fish will then be released back into the Sacramento River at the nearest possible point to minimize transport times. Fish movement data will rely upon data collected by acoustic receivers deployed throughout the Central Valley, Delta, and San Francisco Bay.

Upper Sacramento River Redd Dewatering Surveys and Rescue of Stranded Juvenile Winter-run Chinook Salmon

A recent effort has been made by fisheries agencies (CDFW, PSMFC, USFWS) to annually monitor Sacramento River winter-run Chinook salmon redds. Monitoring includes: searching for, identifying, marking, and repeated measuring of shallow water winter-run redds. This monitoring allows CDFW biologists to predict the flow at which redds will be dewatered on a redd-by-redd basis. Given this knowledge, it is possible to physically modify redds in danger of being dewatered to lessen the

impacts to emerging juveniles in each redd. During the study, each observed redd is classified in the database from a list of five dewatering descriptors ranging from "not dewatered" to "totally dry". For the purposes of this study a dewatered redd is minimally identified as any active redd that has its highest section (the tailspill mound) exposed to the air. This would indicate that the river flow has decreased from the time when the redd was constructed and adverse impacts to egg or juvenile survival could be present. A small number of dewatered redds may be excavated to document the level of mortality resulting from dewatering eggs and/or juveniles.

Winter-run redds in shallow water will be identified and monitored by boat crews to determine formation date and subsequent emergence date of each redd. These redds will be repeatedly measured to determine the depth of water column above the highest point of the redd during each river flow reduction. When a redd is in jeopardy of becoming dewatered, (based on the redd depth and the schedule of flow reductions) CDFW may take action if deemed necessary to reduce the impacts of dewatering. Just prior to a Keswick flow reduction (1-2 days), a field crew will gently remove substrate from the tops of redds that are likely to become dewatered (e.g. redds in water 2-3 inches or less before a 250 cfs reduction). Crews will remove by hand the rocks from the tops of redds to a sufficient depth that will allow water to remain freely flowing over the redd top after the forecasted flow reduction. Redd tops will be removed using a slow and gentle manner to minimize abrasion impacts to fry in the uppermost area removed. Water velocity will be measured at the redd before and after the substrate removal process. Water depth measured from the redd top to the water surface will also be recorded pre and post rock removal. Photographs will document the substrate removal process. Numbers of fry observed during the redd removal will be noted. Crews will revisit and repeat this protocol if necessary on the monitored redds until after the emergence date of each redd in the effort has passed.

Juvenile stranding events and stranding sites are observed while surveying the Sacramento River and side channels by boat and on foot. Efforts to locate and monitor stranding sites are typically conducted from the Tehama Bridge (RM 229) to Keswick Dam (RM 302). Isolated and partially or potentially isolated pools are observed and marked on a handheld GPS. All stranding sites observed are also photographed. Fish present will be enumerated and identified by visual observation, including underwater observation and underwater photography. Juvenile salmonids are to be identified by species, and juvenile Chinook are classified by run based on approximate fork length relative to date. This is accomplished using an electronic version of a Central Valley Chinook length-at-date fork length table (example found in attached document - Jarrett and Killam 2014). Prior to each field survey the fork length table was referenced and the size ranges of all present Chinook runs were recorded for classification in the field. The site location and environmental conditions are also recorded.

CDFW staff will survey known stranding sites immediately following Keswick flow reductions (as feasible), to determine if a fish rescue is necessary. If determined necessary, CDFW staff will seine, net, or electrofish (in this order of priority to reduce negative impacts to already stressed fish) stranding locations based on staffs experience and feasibility at each location.

Some stranding pools are subsequently measured and environmental conditions such as temperature, dissolved oxygen levels, substrate, type of shelter present, etc., are also recorded. Likelihood of juvenile survival will be assessed at observed stranding pools and will be based on current and expected environmental conditions (e.g., if site is isolated and drying up and warm dry weather forecasted, then survival is probably unlikely for that site). The feasibility of juvenile fish rescue and removal from the observed stranding site is also evaluated. This is based on the size and substrate of the stranding site, as well as surrounding habitat. For example fish stranded in a wide, shallow pool with little aquatic vegetation, could be removed and relocated to adjacent flowing water easily using beach seines or other capture methods. Conversely, a deep bedrock pool with submerged debris such as downed logs or tree branches would be very difficult to effectively capture and remove juveniles for relocation.

Stranding sites suitable for rescues containing juvenile salmonids are identified and prioritized based on numbers of fish as well as accessibility. Rescues efforts will involve the use of seine nets of various lengths, dip nets and assorted tubs and buckets. Multiple passes will be made with seine nets at each site and captured fish will

be transferred to buckets of water. Fish are then identified, tallied, and relocated to the nearest flowing river channel with minimal handling.

Another characteristic assessed at each observed stranding site is the potential for re-connection. This is based on the substrate of the stranding site and the proximity to the nearest watered portion of Sacramento River. The feasibility of re-connection includes the potential for use of hand tools (e.g., shovels), power tools (e.g., jack hammers) and more aggressive re-connection using machinery such as backhoes, etc. Both permanent and temporary re-connection techniques are considered during assessment. Documented stranding sites are regularly revisited as resources allow throughout the survey season. The status of each stranding site is evaluated to determine if and when the location reconnects to or disconnects from the main river system. Fish present are counted and identified to assess mortality of stranded juveniles over time.

When conducting rescues within Upper Sacramento River Basin Tributaries, fish will be captured using beach seines. When seining is not feasible other methods such as fyke netting, backpack electroshocking or hook and line may be used as a last resort. If conditions are not suitable for release within the body of water where fish have been rescued (due to low flows, high water temperatures, etc.) a one-ton flat-bed truck fitted with a 200 gallon oxygenated water tank will be used to transport rescued salmonids. Rescued fish will be relocated and released at the Sycamore Boat Launch downstream from the Red Bluff Diversion Dam (RM 243) or the nearest suitable release location on the Upper Sacramento River.

Lethal Take: During capture and relocation of ESA-listed salmonids and sturgeon (Wallace, Fremont and Tisdale weirs), it is expected that incidental mortality associated with the capture, handling, tagging and transport of these fish will be less than 5%. If rescues within the CBDC become necessary, fish will be stressed due to low DO levels and high water temperatures. It is anticipated that incidental mortality associated with rescue and relocation of these fish will be somewhat higher; around 10%. However, it is important to note that without rescue and relocation, these fish would likely otherwise perish.

During Redd Dewatering Surveys, Juvenile Stranding Surveys, and Fish Rescues in Shasta and Tehama counties up to 5% incidental mortality is requested.

Anticipated Effects on Animals: Trapping and handling adult Chinook salmon and sturgeon increases stress and has the potential to impact their arrival to the spawning stretches of the Sacramento River, however no significant adverse effects are anticipated. Without the capture and relocation of these fish, they would likely perish due to low flows and dissolved oxygen coupled with high water temperatures. All environmental factors, traps, and fish condition will be closely monitored throughout the study to reduce any stress experienced by the species captured. Handling and transport times will be minimized to the greatest extent possible.

Measures to Minimize Effects: Capture equipment and water quality parameters will be closely monitored and fish removed in a timely manner to minimize time spent in capture equipment. Additionally, salmon cradles will be used to move fish from the trap to either the river or the transport truck to reduce impacts from handling. Upon release, a gate covering a large opening at the back of the truck will be removed allowing for the release of the fish without additional handling. All possible measures will be taken to expedite the process of capturing, tagging, and releasing adult entrained fish. Only trained and qualified personnel will implant acoustic tags (surgically for green sturgeon or esophageal insertion for adult salmonids) during rescue efforts.

Resources Needed to Accomplish Objectives: Personnel (3 - 5) for the trapping and tagging of salmon, steelhead and sturgeon; 2 vehicles, 2 fish transport tanks/trailers. Equipment such as beach seines, backpack electroshockers, large dip nets, acoustic tags, Floy tags, and PIT tags. A DIDSON unit and laptop will be used and is powered by a Honda 2000 generator. Department of Fish and Wildlife seasonal personnel will be used to conduct the trapping under the direction of an Environmental Scientist.

Disposition of Tissues: A small 2x2 mm genetic sample will be collected from Chinook salmon and SDPS green sturgeon for genetic analysis and race confirmation (Chinook). Samples may also be opportunistically taken from captured steelhead. If large numbers of Chinook salmon are encountered, genetic samples will be taken from a subsample of captured fish. Samples will be labeled and preserved using standard techniques and transferred to the CDFW Tissue Archive in Sacramento, California. If real-time genetic testing becomes necessary, CDFW may send tissue samples to an alternative repository such as Abernathy (USFWS), the Southwest Fisheries Science Center

(NMFS), or the California Department of Water Resources (CDWR). Carcasses or incidental mortalities may be sent to NMFS for otolith extraction and/or further analysis.

Public Availability of Product/Publications: Daily reports on number of fish observed, tagged and rescued will be sent to CDFW, NMFS, USFWS, and Water District managers. Data from this project will give managers a better understanding of the success of the fish recovery efforts, the feasibility of long-term fish trapping and relocation, and ways to reduce straying of Chinook salmon and other species into the Colusa Basin and Central Valley flood relief structures. Further, the nearly "real-time" reporting of redd dewatering provides fishery managers the ability to make management recommendations to prevent the dewatering of redds each monitoring season. An Annual Report for efforts during 2013-2014 is attached.

Location/Take Information

Location
Research Area: Pacific Ocean **State:** CA **Sub Basin (4th Field HUC):** Lower Sacramento **Stream Name:** Sacramento River/Colusa Basin Drainage Canal and Wallace Weir within the Yolo Bypass **Latitude:** 38.902994 **Longitude:** 121.915197
Location Description: The primary trapping location is the Wallace Weir Fish Collection Facility. Trapping may also occur within the CBDC, if necessary.

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Actual Take	Indirect Mort	Actual Mort	Take Action	Observe /Collect Method	Procedure	Run	Transport Record	Begin Date	End Date
1		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Natural	Adult	Male and Female	300	0	15	0	Collect, Sample, and Transport Live Animal	Weir (only if associated with fish handling)	Tag, Floy; Tissue Sample Fin or Opercle	Winter	1	1/1/2016	12/31/2016
Details: Fyke trap will be primary colletction method at Wallace Weir.																	
2		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Listed Hatchery Adipose Clip	Adult	Male and Female	150	0	7	0	Collect, Sample, and Transport Live Animal	Weir (only if associated with fish handling)	Tag, Floy; Tissue Sample Fin or Opercle	Winter	1	1/1/2016	12/31/2016
Details: Fyke trap will be primary collection method at Wallace Weir.																	
3		Salmon, Chinook	Central Valley spring-run (NMFS Threatened)	Natural	Adult	Male and Female	300	0	15	0	Collect, Sample, and Transport Live	Weir (only if associated with fish handling)	Tag, Floy; Tissue Sample Fin or Opercle	Spring	1	1/1/2016	12/31/2016

			Threatened)								Animal	handling)	or Opercle				
Details: Fyke trap will be primary collection method at Wallace Weir.																	
4		Steelhead	California Central Valley (NMFS Threatened)	Natural	Adult	Male and Female	100	0	5	0	Collect, Sample, and Transport Live Animal	Weir (only if associated with fish handling)	Tag, Floy; Tag, PIT; Tissue Sample Fin or Opercle	N/A	1	1/1/2016	12/31/2016
Details: Fyke trap will be primary collection method at Wallace Weir.																	
5		Steelhead	California Central Valley (NMFS Threatened)	Listed Hatchery Adipose Clip	Adult	Male and Female	200	0	10	0	Collect, Sample, and Transport Live Animal	Weir (only if associated with fish handling)	Tag, Floy; Tag, PIT; Tissue Sample Fin or Opercle	N/A	1	1/1/2016	12/31/2016
Details: Fyke trap will be primary collection method at Wallace Weir.																	
6		Sturgeon, green	Southern DPS (NMFS Threatened)	Natural	Adult	Male and Female	25	0	1	0	Collect, Sample, and Transport Live Animal	Weir (only if associated with fish handling)	Tag, Floy; Tissue Sample Fin or Opercle	N/A	1	1/1/2016	12/31/2016
Details: Fyke trap will be primary collection method at Wallace Weir.																	
7		Salmon, Chinook	Central Valley spring-run (NMFS Threatened)	Listed Hatchery Adipose Clip	Adult	Male and Female	200	0	10	0	Collect, Sample, and Transport Live Animal	Weir (only if associated with fish handling)	Tag, Floy; Tissue Sample Fin or Opercle	Spring	1	1/1/2016	12/31/2016
Details: Fyke trap will be primary collection method at Wallace Weir.																	

Location
Research Area: Pacific Ocean **State:** CA **Sub Basin (4th Field HUC):** Lower Sacramento **Stream Name:** Colusa Basin Drainage Canal
Location Description: Rescue/Salvage within the CBDC should fish pass through the resistance board weir (flood events, etc.) Roving DIDSON Surveys may be conducted to locate fish that have entered the CBDC. See Attachment for description of potential trapping locations.

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Actual Take	Indirect Mort	Actual Mort	Take Action	Observe /Collect Method	Procedure	Run	Transport Record	Begin Date	End Date
------	-----	---------	--------------------	--------------------	------------	-----	---------------	-------------	---------------	-------------	-------------	-------------------------	-----------	-----	------------------	------------	----------

1		Salmon, Chinook	Central Valley spring-run (NMFS Threatened)	Natural	Adult	Male and Female	200	0	20	0	Collect, Sample, and Transport Live Animal	Trap, Not listed here	Tag, Floy; Tissue Sample Fin or Opercle	Spring	1	1/1/2016	12/31/2016
Details: Fish will be captured using semi-permanent barriers and fyke traps.																	
2		Salmon, Chinook	Central Valley spring-run (NMFS Threatened)	Natural	Spawned Adult/ Carcass	Male and Female	15	0	0	0	Observe/Sample Tissue Dead Animal	Trap, Not listed here	Tissue Sample Fin or Opercle	Spring	N/A	1/1/2016	12/31/2016
Details: Fish will be captured using semi-permanent barriers and fyke traps.																	
3		Salmon, Chinook	Central Valley spring-run (NMFS Threatened)	Listed Hatchery Adipose Clip	Adult	Male and Female	50	0	5	0	Collect, Sample, and Transport Live Animal	Trap, Not listed here	Tag, Floy; Tissue Sample Fin or Opercle	Spring	1	1/1/2016	12/31/2016
4		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Natural	Spawned Adult/ Carcass	Male and Female	20	0	0	0	Observe/Sample Tissue Dead Animal	Trap, Not listed here	Tissue Sample Fin or Opercle	Winter	N/A	1/1/2016	12/31/2016
Details: Fish will be captured using semi-permanent barriers and fyke traps.																	
5		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Listed Hatchery Adipose Clip	Spawned Adult/ Carcass	Male and Female	20	0	0	0	Observe/Sample Tissue Dead Animal	Trap, Not listed here	Tissue Sample Fin or Opercle	Winter	N/A	1/1/2016	12/31/2016
Details: Fish will be captured using semi-permanent barriers and fyke traps.																	
6		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Natural	Adult	Male and Female	150	0	7	0	Collect, Sample, and Transport Live Animal	Trap, Not listed here	Tag, Floy; Tissue Sample Fin or Opercle	Winter	1	1/1/2016	12/31/2016
Details: Fish will be captured using semi-permanent barriers and fyke traps.																	

7		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Listed Hatchery Adipose Clip	Adult	Male and Female	75	0	5	0	Collect, Sample, and Transport Live Animal	Trap, Not listed here	Tag, Floy; Tissue Sample Fin or Opercle	Winter	1	1/1/2016	12/31/2016
Details: Fish will be captured using semi-permanent barriers and fyke traps.																	

Location

Research Area: Pacific Ocean **State:** CA **Sub Basin (4th Field HUC):** Lower Sacramento **Stream Name:** Yolo and Sutter bypasses

Location Description: Sampling will occur at Fremont Weir in the Yolo Bypass and Tisdale Weir in the Sutter Bypass.

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Actual Take	Indirect Mort	Actual Mort	Take Action	Observe /Collect Method	Procedure	Run	Transport Record	Begin Date	End Date
1		Salmon, Chinook	Central Valley spring-run (NMFS Threatened)	Natural	Adult	Male and Female	25	38	1	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Tag, Floy; Tissue Sample Fin or Opercle	Spring	N/A	1/1/2016	12/31/2016
2		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Natural	Adult	Male and Female	25	1	1	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Tag, Floy; Tissue Sample Fin or Opercle	Winter	N/A	1/1/2016	12/31/2016
3		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Listed Hatchery Adipose Clip	Adult	Male and Female	25	1	1	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Tag, Floy; Tissue Sample Fin or Opercle	Winter	N/A	1/1/2016	12/31/2016
4		Steelhead	California Central Valley (NMFS Threatened)	Natural	Adult	Male and Female	20	0	1	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Anesthetize; Tag, Floy; Tag, PIT; Tissue Sample Fin or Opercle	N/A	N/A	1/1/2016	12/31/2016

5		Sturgeon, green	Southern DPS (NMFS Threatened)	Natural	Juvenile	Male and Female	10	0	1	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Net, Hoop	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle	N/A	N/A	1/1/2016	12/31/2016
6		Sturgeon, green	Southern DPS (NMFS Threatened)	Natural	Adult	Male and Female	35	1	1	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Net, Hoop	Tag, Acoustic or Sonic (Internal); Tag, Floy; Tissue Sample Fin or Opercle	N/A	N/A	1/1/2016	12/31/2016
7		Sturgeon, green	Southern DPS (NMFS Threatened)	Natural	Subadult	Male and Female	15	0	1	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Net, Hoop	Tag, Acoustic or Sonic (Internal); Tag, Floy; Tissue Sample Fin or Opercle	N/A	N/A	1/1/2016	12/31/2016
8		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Natural	Juvenile	Male and Female	200	22	3	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Anesthetize; Tissue Sample Fin or Opercle	Winter	N/A	1/1/2016	12/31/2016
9		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Listed Hatchery Adipose Clip	Juvenile	Male and Female	200	5	3	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Anesthetize; Tissue Sample Fin or Opercle	Winter	N/A	1/1/2016	12/31/2016
10		Salmon, Chinook	Central Valley spring-run (NMFS Threatened)	Natural	Juvenile	Male and Female	300	1	5	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Anesthetize; Tissue Sample Fin or Opercle	Spring	N/A	1/1/2016	12/31/2016
11		Steelhead	California Central Valley (NMFS Threatened)	Natural	Juvenile	Male and Female	300	0	5	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle	N/A	N/A	1/1/2016	12/31/2016

12		Steelhead	California Central Valley (NMFS Threatened)	Listed Hatchery Adipose Clip	Juvenile	Male and Female	500	62	10	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle	N/A	N/A	1/1/2016	12/31/2016
13		Steelhead	California Central Valley (NMFS Threatened)	Listed Hatchery Adipose Clip	Adult	Male and Female	15	0	1	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Tag, Floy; Tag, PIT; Tissue Sample Fin or Opercle	N/A	N/A	1/1/2016	12/31/2016

Location

Research Area: Pacific Ocean **State:** CA **Sub Basin (4th Field HUC):** Sacramento-Lower Thomes **Stream Name:** Tributaries to Upper Sacramento River - Antelope, Deer and Mill creeks.
Location Description: Fish rescues will be conducted as needed in various tributaries to the Upper Sacramento River, including but not limited to Antelope, Deer and Mill creeks. These rescues will be carried out in conjunction with the Upper Sacramento River fish rescues.

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Actual Take	Indirect Mort	Actual Mort	Take Action	Observe /Collect Method	Procedure	Run	Transport Record	Begin Date	End Date
1		Salmon, Chinook	Central Valley spring-run (NMFS Threatened)	Natural	Adult	Male and Female	100	0	2	0	Collect, Sample, and Transport Live Animal	Seine, Beach	Tissue Sample Fin or Opercle	Spring	2	1/1/2016	12/31/2016
2		Salmon, Chinook	Central Valley spring-run (NMFS Threatened)	Natural	Juvenile	Male and Female	2000	1	40	0	Collect, Sample, and Transport Live Animal	Seine, Beach	Tissue Sample Fin or Opercle	Spring	2	1/1/2016	12/31/2016
3		Steelhead	California Central Valley (NMFS Threatened)	Natural	Adult	Male and Female	200	3	5	0	Collect, Sample, and Transport Live Animal	Seine, Beach	Tag, PIT; Tissue Sample Fin or Opercle	N/A	2	1/1/2016	12/31/2016

4		Steelhead	California Central Valley (NMFS Threatened)	Natural	Juvenile	Male and Female	2000	0	40	0	Collect, Sample, and Transport Live Animal	Seine, Beach	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle	N/A	2	1/1/2016	12/31/2016
5		Salmon, Chinook	Central Valley spring-run (NMFS Threatened)	Natural	Smolt	Male and Female	200	0	5	0	Collect, Sample, and Transport Live Animal	Seine, Beach	Tissue Sample Fin or Opercle	Spring	2	1/1/2016	12/31/2016
6		Steelhead	California Central Valley (NMFS Threatened)	Natural	Smolt	Male and Female	200	124	5	0	Collect, Sample, and Transport Live Animal	Seine, Beach	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle	N/A	2	1/1/2016	12/31/2016

Location
Research Area: Pacific Ocean **State:** CA **Sub Basin (4th Field HUC):** Sacramento-Lower Thomes **Stream Name:** Upper Sacramento River **Begin Mile:** 229.0 **End Mile:** 302.0
Location Description: Rescues, redd dewatering/juvenile stranding surveys, and ongoing side channel (natural and restored) surveys will be conducted in the Upper Sacramento River from the city of Tehama (RM 229) upstream to Keswick Dam (RM 302).

Take Information

Line	Ver	Species	Listing Unit/Stock	Production /Origin	Life Stage	Sex	Expected Take	Actual Take	Indirect Mort	Actual Mort	Take Action	Observe /Collect Method	Procedure	Run	Transport Record	Begin Date	End Date
1		Salmon, Chinook	Central Valley spring-run (NMFS Threatened)	Natural	Juvenile	Male and Female	2000	26	4	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Anesthetize; Tissue Sample Fin or Opercle	Spring	N/A	1/1/2016	12/31/2016
Details: Fyke net or backpack electrofisher may also be used if necessary.																	
2		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Listed Hatchery Adipose Clip	Juvenile	Male and Female	500	6	20	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Anesthetize; Tissue Sample Fin or Opercle	Winter	N/A	1/1/2016	12/31/2016

Details: Fyke net or backpack electrofisher may also be used if necessary.																	
3		Salmon, Chinook	Sacramento River winter-run (NMFS Endangered)	Natural	Juvenile	Male and Female	15000	0	50	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Anesthetize; Tissue Sample Fin or Opercle	Winter	N/A	1/1/2016	12/31/2016
Details: Fyke net or backpack electrofisher may also be used if necessary.																	
4		Steelhead	California Central Valley (NMFS Threatened)	Natural	Juvenile	Male and Female	1000	17	2	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle	N/A	N/A	1/1/2016	12/31/2016
Details: Fyke net or backpack electrofisher may also be used if necessary.																	
5		Steelhead	California Central Valley (NMFS Threatened)	Natural	Adult	Male and Female	50	17	1	0	Capture/Mark, Tag, Sample Tissue/Release Live Animal	Seine, Beach	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle	N/A	N/A	1/1/2016	12/31/2016
Details: Fyke net or backpack electrofisher may also be used if necessary.																	

Transport Information

1.

Mode(s) of Transportation:

Fish will be placed into 350-400 gallon CDFW fish transport trucks for release into the Lower Sacramento River near Tisdale Weir in Sutter County, CA. One or two fish transport tanks will be used depending on the number of salmon relocated per day.

Transportation Company:

CDFW Fish Transport Trucks will be used.

Maximum amount of time between capture and arrival:

The trapping location will be approximately 14 miles downstream of the release location. Once fish are captured, processed and loaded into trucks, travel and release time should be less than one hour.

Container Description:

350-400 gallon CDFW Fish Transport Trucks will be used.

Special Care:

Water temperature and dissolved oxygen levels will be closely monitored.

Accompanying Personnel Qualifications:

Fish will be accompanied by well-trained Fisheries Biologists and Environmental Scientists from the various fish regulatory agencies (CDFW, USFWS, NMFS, etc.)

Facility Title:

Tisdale Weir and Boat Launch

Facility Affiliation/Organization:

Address: Sutter County, CA UNITED STATES

Phone Number:

Containment Method: N/A

Final Disposition: Fish will be released directly into the Sacramento River. Upon release, a gate covering a large opening at the back of the transport truck will be removed allowing for the volitional release of fish eliminating the need for additional handling.

2.

Mode(s) of Transportation:

Rescue efforts will involve the use of a one-ton flat-bed truck fitted with a 200 gallon oxygenated water tank to transport rescued fish and release into the Sacramento River.

Transportation Company:

CDFW Fish Transport Trucks will be used and operated by qualified CDFW staff.

Maximum amount of time between capture and arrival:

Transport time should be no more than 1-2 hours, as fish will be relocated to the nearest suitable location on the Sacramento River.

Container Description:

A one-ton flat-bed truck fitted with a 200 gallon oxygenated water tank will be used to transport rescued salmonids.

Special Care:

The 200 gallon tank will be filled half with Sacramento River water and half with water from the rescue site/creek to acclimate the captured fish. Ice will be supplied to maintain tank water temperatures below 17.2 degrees Celsius.

Accompanying Personnel Qualifications:

Fish will be accompanied by well-trained Fisheries Biologists and Environmental Scientists from the various fish regulatory agencies (CDFW, USFWS, NMFS, etc.)

Facility Title:

Sycamore Boat Launch below the Red Bluff Diversion Dam

Facility Affiliation/Organization:

Address:

River Mile (RM) 243
Red Bluff, CA UNITED STATES

Phone Number:

Containment Method:

N/A

Final Disposition:

Rescued fish will be relocated and released at the Sycamore Boat Launch downstream from the Red Bluff Diversion Dam (RM 243) or the nearest suitable release location on the Upper Sacramento River.

NEPA Checklist

This section is currently empty.

Project Contacts

Responsible Party: Kevin Shaffer
Primary Contact: Marc Beccio
Principal Investigator: Jason Roberts

Other Personnel:

Name	Role(s)
Nick Balfour	Co-Investigator
Amanda Banet	Co-Investigator
Alyssa Caldwell	Co-Investigator
Michelle Coldiron	Co-Investigator
Andrew Coloma	Co-Investigator
Diane Coulon	Co-Investigator
Linda Drobatz	Co-Investigator
George Edwards	Co-Investigator
Justin Fairchild	Co-Investigator
Clint Garman	Co-Investigator
Michael Gillingham	Co-Investigator
Tyler Goodearly	Co-Investigator
Vaughn Harold	Co-Investigator
Michael P Healey	Co-Investigator
Michelle Holtz	Co-Investigator
Andrew Huneycutt	Co-Investigator
Matthew Raymond Johnson	Co-Investigator
Jason M Julienne	Co-Investigator
Douglas Scott Killam	Co-Investigator
Hideaki Shig Kubo	Co-Investigator
Alexandra Laughtin	Co-Investigator

Nathan Maroon	Co-Investigator
Margaux McClure	Co-Investigator
Christian McKibbin	Co-Investigator
Tracy McReynolds	Co-Investigator
Kevin Moncrief	Co-Investigator
Megan O'Connor	Co-Investigator
Carson Odegard	Co-Investigator
Jeanine Phillips	Co-Investigator
Brian Raleigh	Co-Investigator
Ryan Revnak	Co-Investigator
Cameron Reyes	Co-Investigator
Chad Richardson	Co-Investigator
Lanette Richardson	Co-Investigator
Dylan Stompe	Co-Investigator
Tho (Kenny) Tran	Co-Investigator
Brad Underwood	Co-Investigator
Stephanie Walls	Co-Investigator

Summary

Describe any problems and/or any unforeseen effects and any steps taken (or proposed) to resolve such problems.

One problem of note is the probable take of a southern DPS green sturgeon by poachers stranded on the apron of the west section of the Fremont Weir on 31 March 2016, the day prior to scheduled fish rescue operations. CDFW wardens were notified of the presence of sturgeon stranded on the Fremont Weir apron and they were patrolling the area. However; the probable poaching event likely took place between patrol shifts.

Proposed steps to prevent future poaching events will include increased surveillance by CDFW Wildlife Officers at potential stranding sites where southern DPS green sturgeon and listed salmonids were previously rescued or observed (e.g., Fremont Weir, Tisdale Weir).

The permanent fish collection facility at Wallace Weir is currently under construction and was not used for fish rescue or salvage during 2016. Fish rescue operations were conducted at an alternate site on the Knights Landing Ridge Cut and Colusa Basin Drainage Canal prior to high winter flows in the Yolo Bypass. No listed salmonids or southern DPS green sturgeon were rescued at the alternate site on the Knights Landing Ridge Cut and Colusa Basin Drainage Canal sites.

Describe what measures were taken to minimize the permitted activities' effects on animals and the effectiveness of these measures.

Capture, handling, tagging, and transport methods used during rescues conducted for southern DPS green sturgeon, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead minimized overall handling time. Water temperatures were monitored in holding tubs and ice was added as necessary to insure that water temperatures approximated Sacramento River release point water temperatures.

If animals were unintentionally injured or killed, describe the circumstances. Describe how they were disposed of if it wasn't in the way described in the authorization/permit.

No unintentional injuries or mortalities of southern DPS green sturgeon, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead were observed during rescue efforts.

Describe the physical condition of animals taken and used in the permitted activities.

All captured and tagged southern DPS green sturgeon, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead were held and observed for complete recovery prior to release and appeared to be in good condition at the time of release.

Describe the effects permitted activities had on animals, including any unforeseen responses or effects.

The southern DPS green sturgeon rescued from the Fremont Weir on 29 March 2016 was acoustically tagged and released in the Sacramento River and subsequently detected moving upstream at real-time acoustic receivers at Knights Landing on 30 March 2016 and at Colusa on 2 April 2016. Several Central Valley spring-run Chinook salmon captured at the Tisdale Weir apron were tagged with external anchor tags and released in the Sacramento River at the Tisdale boat ramp. These salmon were subsequently observed as post-spawn carcasses during Butte Creek carcass surveys.

If applicable, describe the method used to estimate take if it differed from your proposed method.

Not applicable.

State what steps were taken to coordinate the permitted activities with other permit holders.

Not applicable.

Summarize any preliminary findings. Did you accomplish your project goals?

The southern DPS green sturgeon rescued from the Fremont Weir was acoustically tagged and released in the Sacramento River. It was later detected moving upstream by acoustic receivers at Knights Landing and Colusa. One Central Valley spring-run Chinook salmon captured at the Tisdale Weir apron and tagged with external and released in the Sacramento River. It was later observed as a post-spawn carcass during the Butte Creek carcass survey. The project goal was accomplished in that at least two rescued fish survived to reproduce.

List titles of reports, publications, etc. resulting from this reporting period.

Not applicable

Provide any additional findings, results, or information you would like to report or comment on.

Fish rescues were conducted at Fremont Weir, Tisdale Weir, Wallace Weir, the main stem Sacramento River, and Sacramento River tributaries.

Take

Attachments

This section is currently empty.